

Amendments to the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application. Underlines indicate insertions and ~~strikeouts~~ indicate deletions.

1. (Currently Amended) A system for the spray forming manufacture of near net shape molds, dies and related toolings, comprising:

a nozzle having a flow channel, said flow channel having an inlet end, an outlet end and a longitudinal axis;

a liquid reservoir in fluid communication with said nozzle flow channel, said reservoir adapted to contain a liquid material capable of forming a mold, said liquid being pressurized in a pressurized reservoir and injected from said reservoir through a conduit ending in said nozzle flow channel between said inlet and outlet ends and proximate to said nozzle longitudinal axis;

means for flowing a high temperature atomizing gas ~~at a flow velocity ranging from high subsonic through supersonic velocities~~ through the nozzle flow channel from the inlet end to the outlet end at a pressure range of 20 psia to 30 psia to atomize the liquid injected into the flow channel into a plume of atomized droplets;

a chamber adapted to contain a quench gas having a controlled temperature and composition for increasing in-flight convection cooling of the atomized droplets thereby enhancing formation of undercooled and partially solidified droplets;

means for directing and depositing the undercooled and partially solidified droplets onto a pattern to form the mold.

2. (Original) The system of claim 1 wherein said quench gas is selected from a group

consisting of nitrogen, helium, argon, oxygen, air, and combinations thereof.

3. (Previously Amended) The system of claim 1 further comprising means for independently heating the nozzle and the reservoir.

4. (Previously Amended) The system of claim 1 further comprising means for providing relative movement between the nozzle and the pattern.

5. (Original) The system of claim 1 wherein a plurality of liquid materials capable of forming a mold are injected separately into the nozzle flow channel.

6. (Original) The system of claim 1 wherein the nozzle flow channel converges to a choke portion located between the inlet end and the outlet end, and diverges between the choke portion and the outlet end.

7. (Original) The system of claim 1 wherein the liquid material is injected into the nozzle flow channel proximate to the longitudinal axis between the inlet end and the choke portion of the flow channel.

8. (Original) The system of claim 1 wherein the liquid material is injected into the nozzle flow channel proximate to the longitudinal axis between the choke portion and the outlet end of the flow channel.

9-15. (Canceled)

16. (Original) The system of claim 1 wherein the means for injecting the liquid material into the nozzle flow channel is accomplished by pressurizing the liquid reservoir.

17. (Original) The system of claim 1 wherein the nozzle flow channel has a linear transverse cross-sectional geometry.

18. (Currently Amended) A system for the spray forming manufacture of near net shape molds, dies and related toolings, comprising:

a plurality of nozzles, each nozzle having a flow channel, each of said flow channels having an inlet end, an outlet end and a longitudinal axis;

a liquid reservoir in fluid communication with each of said nozzle flow channels, said reservoir adapted to contain a liquid material capable of forming a mold, said liquid being pressurized in a pressurized reservoir and injected from said reservoir through a conduit ending in said nozzle flow channel between said inlet and outlet ends and proximate to said nozzle longitudinal axis;

a high temperature atomizing gas ~~at a flow velocity ranging from high subsonic through supersonic velocities~~ flowing through each of the nozzle flow channels from the inlet end to the outlet end at a pressure range of 20 psia to 30 psia to atomize the liquid injected into the flow channels into a plume of atomized droplets directed to a chamber adapted to contain a quench

gas having a controlled temperature and composition for increasing in-flight convection cooling of the atomized droplets thereby enhancing formation of undercooled and partially solidified droplets;

means for directing and depositing the undercooled and partially solidified droplets onto a pattern to form the mold.

19. (Previously Amended) The system of claim 18 further comprising means for independently heating the nozzles and the reservoirs.

20. (Previously Amended) The system of claim 18 further comprising means for providing relative movement between the nozzle and the pattern.

21. (Original) The system of claim 18 wherein a plurality of liquid materials capable of forming a mold are injected separately into the nozzle flow channel.

22. (Original) The system of claim 18 wherein the nozzle flow channel converges to a choke portion located between the inlet end and the outlet end, and diverges between the choke portion and the outlet end.

23. (Original) The system of claim 22 wherein the liquid material is injected into the nozzle flow channel proximate to the longitudinal axis between the inlet end and the choke portion of the flow channel.

24. (Original) The system of claim 22 wherein the liquid material is injected into the nozzle flow channel proximate to the longitudinal axis between the choke portion and the outlet end of the flow channel.

25-31. (Canceled).

32. (Original) The system of claim 18 wherein the means for injecting the liquid material into each of the nozzle flow channels is accomplished by pressurizing the liquid reservoir.

33. (Original) The system of claim 18 wherein each of the nozzle flow channels has a linear transverse cross-sectional geometry.

34. (Currently Amended) A system for the spray forming manufacture of near net shape molds, dies and related toolings, comprising:

a nozzle having a flow channel, said flow channel having an inlet end, an outlet end, and a longitudinal axis;

a plurality of reservoirs in separate fluid communication with said nozzle flow channel, at least one of said reservoirs adapted to contain under pressure a liquid material capable of forming a mold and injected from said reservoir through a conduit ending in said nozzle flow channel between said inlet and outlet ends and proximate to said nozzle longitudinal axis;

means for flowing a high temperature atomizing gas ~~at a flow velocity ranging from high~~

~~subsonic through supersonic velocities~~ through the nozzle flow channel from the inlet end to the outlet end at a pressure range of 20 psia to 30 psia to atomize the liquid injected into the flow channel into a plume of atomized droplets directed to a chamber adapted to contain a quench gas having a controlled temperature and composition for increasing in-flight convection cooling of the atomized droplets thereby enhancing formation of undercooled and partially solidified droplets;

means for directing and depositing the undercooled and partially solidified droplets onto a pattern to form the mold.

35. (Original) The system of claim 34 wherein at least one of said plurality of reservoirs contains solid particles, said solid particles being injected into said nozzle flow channel between said inlet and outlet ends and proximate to said flow channel longitudinal axis, said injected solid particles thereby mixing with the injected liquid materials and codeposited onto a pattern to form the mold.